WS2805

Single wire, 256 grayscale, 5 Channels Constant Current LED Drive IC

Main Features

- The **OUTR**、**G**、**B**、**W1**、**W2** ports withstand a voltage of **20V, DIN/DOUT** port withstands **24V** .
- The chip includes a built-in voltage regulator; for power supplies below 24V, simply connect a resistor in series to the VDD pin—no external regulator is required.
- The chip is equipped with an internal resistor. The DIN and DOUT ports have over-voltage protection, so a momentary short-circuit of 24V will not cause burnout.
- The device features a built-in signal shaping circuit that processes signals into optimized waveforms before output, preventing cumulative waveform distortion along the transmission path.
- It features built-in power-on reset and power-off reset circuits.
- The PWM control unit supports 256-level adjustment with a scanning frequency of 4 kHz.
- A serial interface cascaded interface that enables data reception and decoding via a single signal line.
- Single-wire Self-By pass function.One additional signal line is added to realize double signal transmission. Any single pixel failure won't affect the overall display effect.
- The transmission distance between any two points does not exceed 5 meters without requiring additional circuits.
- When the refresh rate is 30 frames per second, the number of cascades can be at least 1024 points.
- Data transmission speed can reach up to 800 Kbps.

Main Applications

- LED full-color pixel string and LED full-color modules.
- LED full-color flexible LED strips, Rigid LED strips, and LED guardrail tubes.
- LED point light sources, LED pixel displays, and LED custom-shaped displays.
- Various electronic products, electrical equipment, running lights.
- Other various LED lighting products.

Product Overview

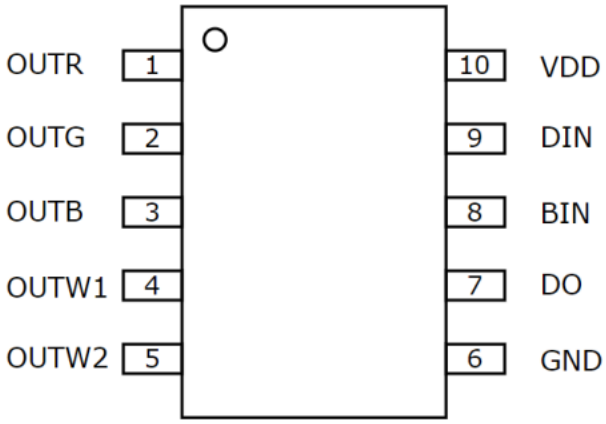
The **WS2805** is **5** output channels special for LED driver circuit. Its internal includes intelligent digital port data latch and signal reshaping amplification drive circuit. Also include a precision internal oscillator and a **20V** voltage programmable constant current output drive.At the same time, to reduce the power supply ripple, the **OUTR**、**G**、**B**、**W1**、**W2** channels have a delayed conduction function. During frame refreshing, this can lower the circuit ripple.

IC use single single wire RZ protocol. After the chip power-on reset, the DIN1 port receive data from controller, the first IC collect initial **40bit** data then sent to the internal data latch, the other data which reshaping by the internal signal reshaping amplification circuit sent to the next cascade IC through the DO port. After transmission for each chip, the signal will reduce **40bit.** IC adopt auto reshaping transmit technology, making the chip cascade number is not limited the signal transmission, only depend on the speed of signal transmission.

The data latch inside the chip generates different duty cycle control signals at the OUTR 、 G 、 B、 W1 、 W2 control terminals based on the received **40-bit** data. When a RESET signal is input at the DIN terminal, all chips synchronously send the received data to each segment. After the signal ends, the chips will receive the data again. After receiving the initial **40-bit** data, the data port is forwarded through the DO port. Before the chip receives the RESET code, the original output of the OUTR 、G 、B 、W1 、W2 pins remains unchanged. When a low-level RESET code above **280μs** is received, The chip outputs the **40-bit** PWM data pulse width just received to the OUTR 、 G 、 B 、 W1 、 W2 pins.

Provide SOP810 package.

PIN configuration



PIN function

NO.	Symbol	PIN	Function description
1	OUTR	LED Driver Output	Output of RED PWM control
2	OUTG	LED Driver Output	Output of GREEN PWM control
3	OUTB	LED Driver Output	Output of BLUE PWM control
4	OUTW1	LED Driver Output	Output of WHITE W1 PWM control
5	OUTW2	LED Driver Output	Output of WHITE W2 PWM control
6	GND	Ground	Data & Power Grounding
7	DOUT	Data output	Data Output
8	BIN	Bypass signal input	Bypass signal input
9	DIN	Main signal input	Control data1 input
10	VDD	Logic Voltage	IC power supply

Absolute Maximum Ratings(TA = 25°C, VSS = 0 V)

Parameter	Symbol	Ratings	Unit
Power Supply Voltage	V_{DD}	+3.5~+5.8	V
R、G、B、W1、W2 Channel S、 Output Port Withstand Voltage	V_{OUT}	20	V
DIN Withstand Voltage	V_I	VDD-0.7～VDD+0.7V	V
Working Temperature	Topt	-40～+85	℃
Storage Temperature Range	Tstg	-40~+105	℃

Electrical parameters (TA = 25°C, VDD = 4.5–5.5 V, VSS = 0 V)

Parameter	Symbol	Min	Tpy	Max	Unit	Conditions
Static current	Io	——	0.6	——	mA	DC=5V
R、G、B、W1、W2 Low voltage output current	I_{OL}	14.5	16	17.5	mA	DC=5V, DIN（FFH）
Low voltage output current	I_{dout}	10	——	——	mA	Vo=0.4V，D_{OUT}
Input current	I_I	——	——	±1	μA	V_I=V_{DD}/V_{SS}
High voltage input	V_{IH}	0.55V_{DD}	——	——	V	D_{IN}
Low voltage input	V_{IL}	——	——	0.3 V_{DD}	V	D_{IN}
Hysteresis voltage	V_H	——	0.35	——	V	D_{IN}

Switching characteristics (TA = 25°C, VDD = 4.5–5.5 V, VSS = 0 V)

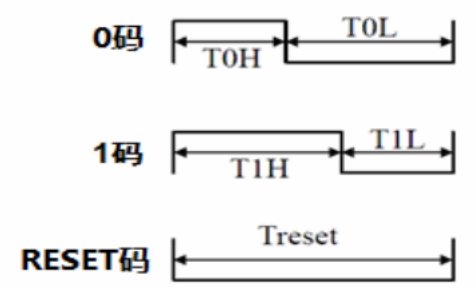
Parameter	Symbol	Min	Tpy	Max	Unit	Condition
Oscillation frequency	*Fosc*	——	800	——	KHz	——
Transmission delay time	tPLZ	——	——	300	ns	CL=15pF, DIN→DOUT, RL=10KΩ
Fall time	tTHZ	——	——	120	μs	CL=300pF, OUTR/OUTG/OUTB
Data transmission rate	*FMAX*	600	——	——	Kbps	Occupancy Ratio 50%
Input capacity	CI	——	——	15	pF	——

Data Transmission Time

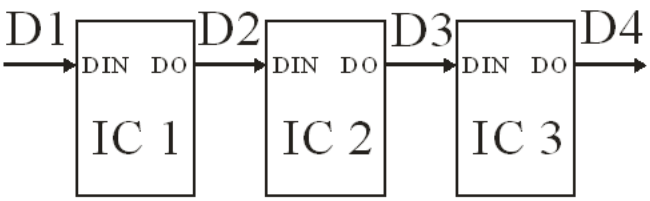
T0H	0 code, high level duration	220ns~380ns
T1H	1 code, high level duration	580ns~1us
T0L	0 code, low-level duration	580ns~1us
T1L	1 code, low-level duration	580ns~1us
RES	Frame unit, low-level duration	>280μs
T_{DATA}	Data Cycle(TH+TL)	⩾1.25us

Time Series Waveform Chart

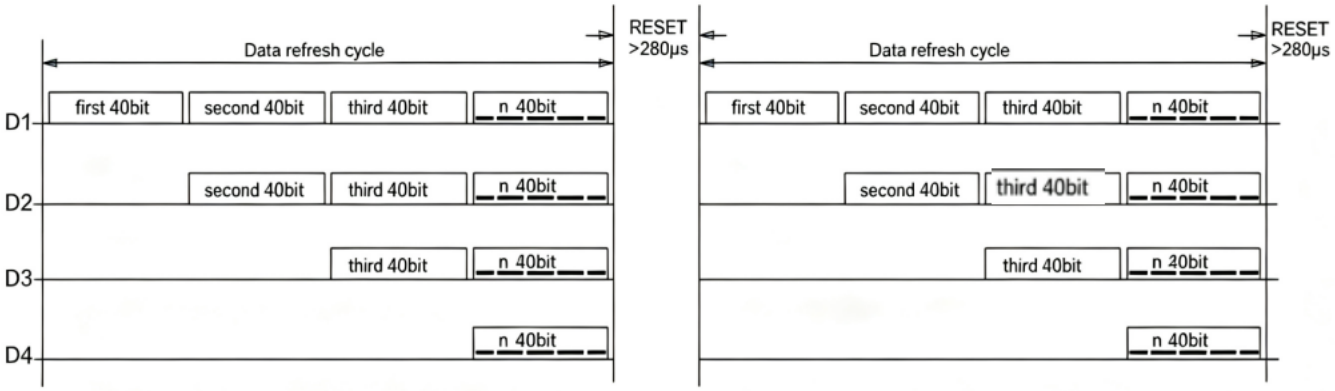
Sequence Chart



Cascade Method



Data Transmission Method



Note: D1 represents data transmitted by the MCU, while D2, D3, and D4 denote data automatically shaped and forwarded by the cascaded circuit.

40 bit Data Structure

R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	···Continued···

···Continued···	B7	B6	B5	B4	B3	B2	B1	B0	W_17	W_16	W_15	W_14	W_13	W_12	W_11	W_10	···Continued···

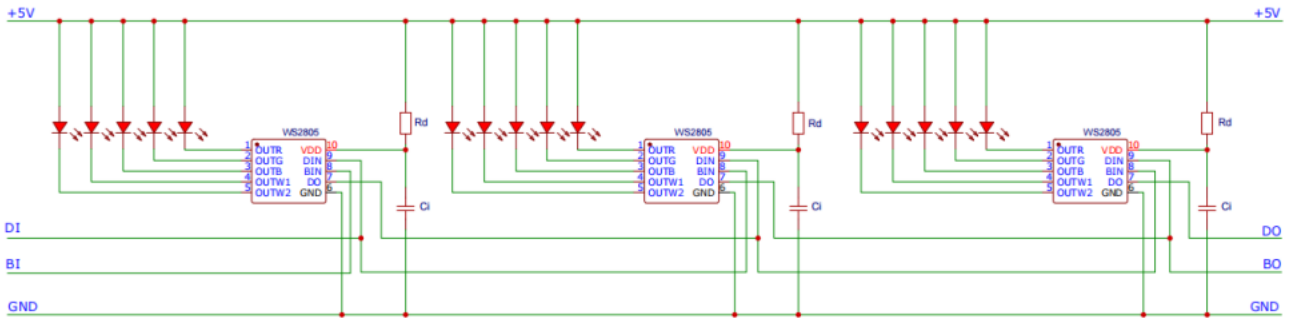
···Continued···	W_27	W_26	W_25	W_24	W_23	W_22	W_21	W_20

Note: Data transmit in order of $RGBW_1W_2$, high bit data at first.

Typical Application Circuit

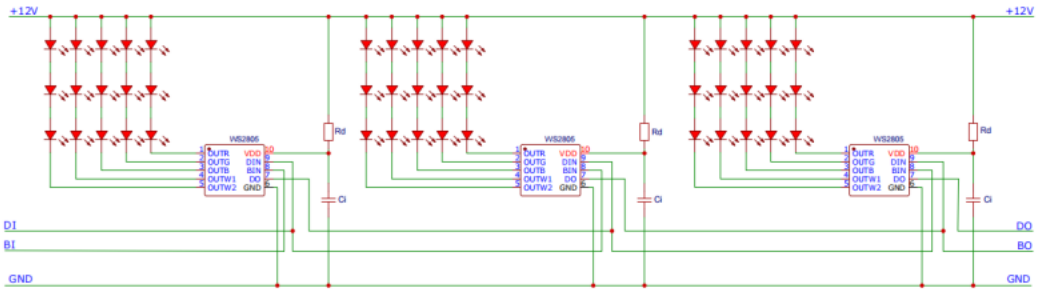
1. Supply voltage=5V, 1 LED for each channel

The recommended value for Rd is 150 R, and the recommended value for Ci is 1 μF.



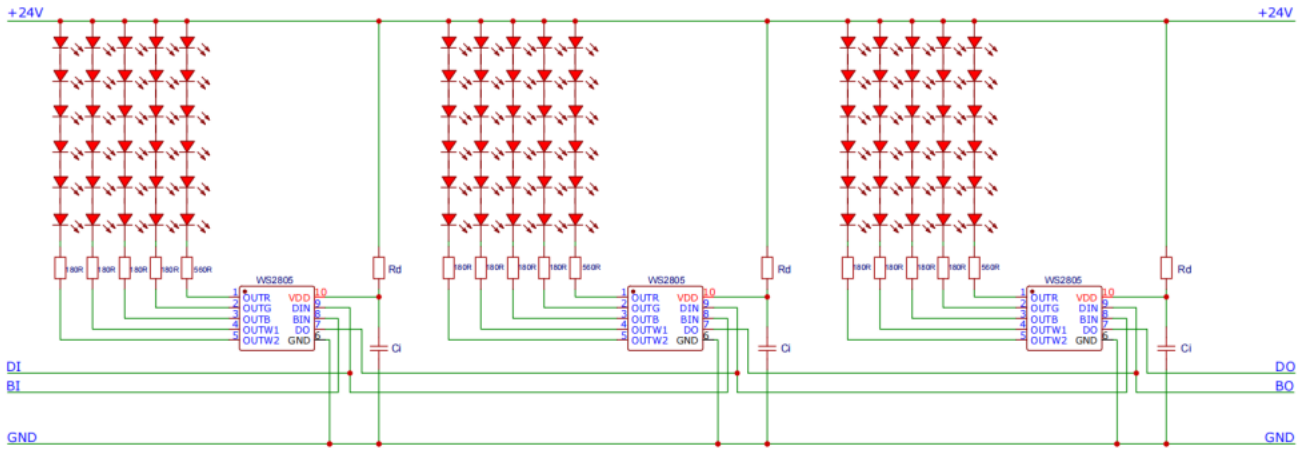
2. Supply voltage=12V, 3 LED for each channel

The recommended values are 3.3 k for Rd and 1 μF for Ci.



3. Supply voltage=24V, 6 LED for each channel

The recommended value for Rd is 7.5 k, and the recommended value for Ci is 1 μF.



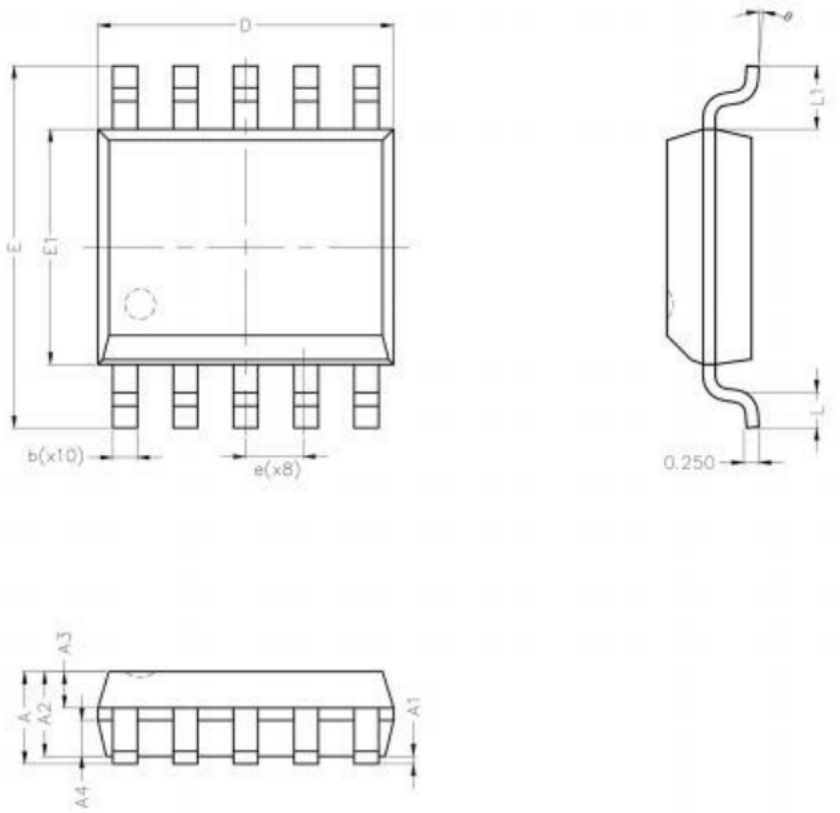
Remark:

1.DIN is the main input signal and BIN is the backup input signal. Under normal circumstances, the IC extracts signals from the DIN. When one IC among them is damaged, the latter IC extracts the signal from the BIN without affecting the signal transmission of the subsequent ics.

2. For the finished product application, the BIN pin of the first IC can't be left floating. It is recommended to connect it to GND.

Package information

- **SOP10 Packaging**



	SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS	A	–	–	1.75
STAND OFF	A1	0.05	0.125	0.20
MOLD TOTAL THICKNESS	A2	1.30	1.40	1.60
TOP MOLD THICKNESS	A3	0.55	0.60	0.65
BOTTOM MOLD THICKNESS	A4	0.547	0.597	0.647
LEAD WIDTH	b	0.31	–	0.53
MOLD LENGTH	D	4.80	4.90	5.00
MOLD WIDTH	E1	3.80	3.90	4.00
LEAD SPAN	E	5.80	6.00	6.20
LEAD PITCH	e	1.00 BSC		
LEAD LENGTH	L1	0.95	1.05	1.15
LEAD SOLE LENGTH	L	0.40	0.60	0.80
LEAD FORM ANGLE	θ	0°	–	8°

Modify Records

Version №	Status Bar	Modify Content Summary	Date	Reviser	Approved
V1.0	N	New-built	20230719	Hu Jin	Yin Huaping
V1.1	M	Correction current	20231013	Hu Jin	Yin Huaping
V1.2	M	Modification detailed parameters	20240305	Chen YongZhao	Yin Huaping
V1.3	M	Add application circuit diagrams	20240904	OuYang Yu	Yin Huaping
V1.4	A	Add application circuit description	20250701	Chen Yongzhao	Yin Huaping
V1.5	M	High-level input	20250806	Chen Yongzhao	Yin Huaping
V1.6	M	Update Logo	20260714	Chen Yongzhao	Yin Huaping

Remarks: Initial version: V1.0； Version number plus "0.1" after each revision;
Status bar: N--New, A--Add, M--Modify, D--Delete.